Midwest Stream-Quality Assessment

A Collaboration Between the:

USGS: National Water Quality Assessment *(NAWQA)* and Columbia Environmental Research Center *(CERC)*,
USEPA: National Rivers and Streams Assessment *(NRSA)* Programs

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USGS

Regional Stream Quality Assessments

- Status of the stream quality in the region
- Relations between stressors and ecological condition
- Relations between environmental setting and stream quality
- Spatially explicit predictions of stressors and ecological responses regionally

NRSA/MSQA study (2013-14)

Goal: Evaluate multiple stressors on biological communities in the Temperate Plains (Cornbelt)

- National Rivers and Streams Assessment (NRSA):
  - Large sample size
  - Random
  - One chemical sample
- Midwest Stream Quality Assessment (MSQA):
  - Smaller sample size
  - Targeted, maximize gradient
  - More intensive stressor analysis

MSQA components

- Geographic distribution and seasonal changes in stressors
  - Contaminants, nutrients, and sediment in water seasonally
  - Contaminants in sediment
  - Contaminants in time-integrating samplers
  - Toxicity of sediment and water
- Ecological conditions
  - Ecological sampling at all sites and regional estimates of condition
- Modeling/prediction

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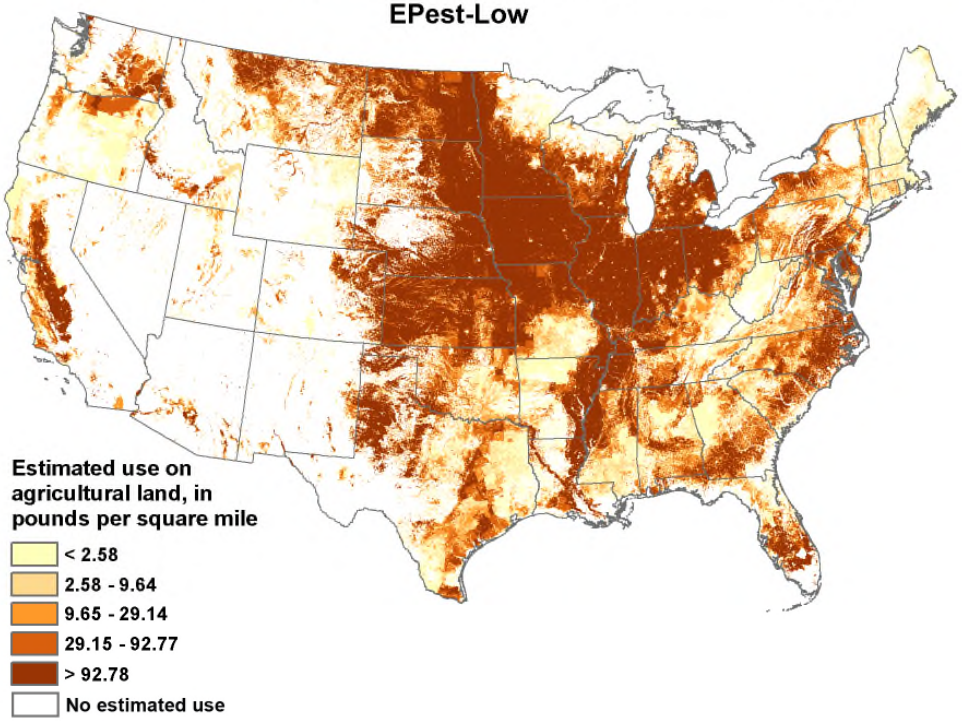
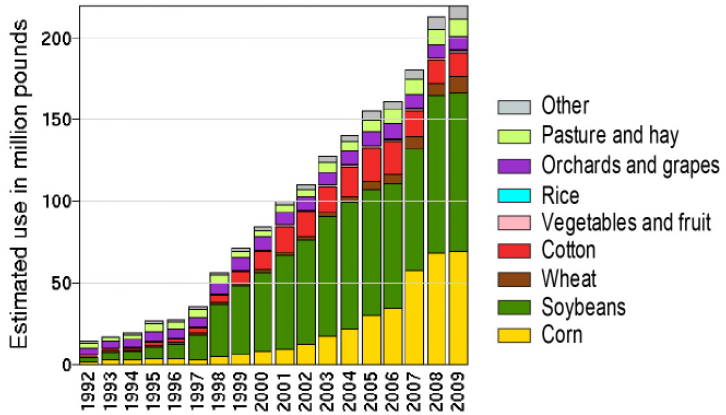
VALMETAL

Estimated Agricultural Use for Glyphosate , 2009

EPest-Low



Use by Year and Crop



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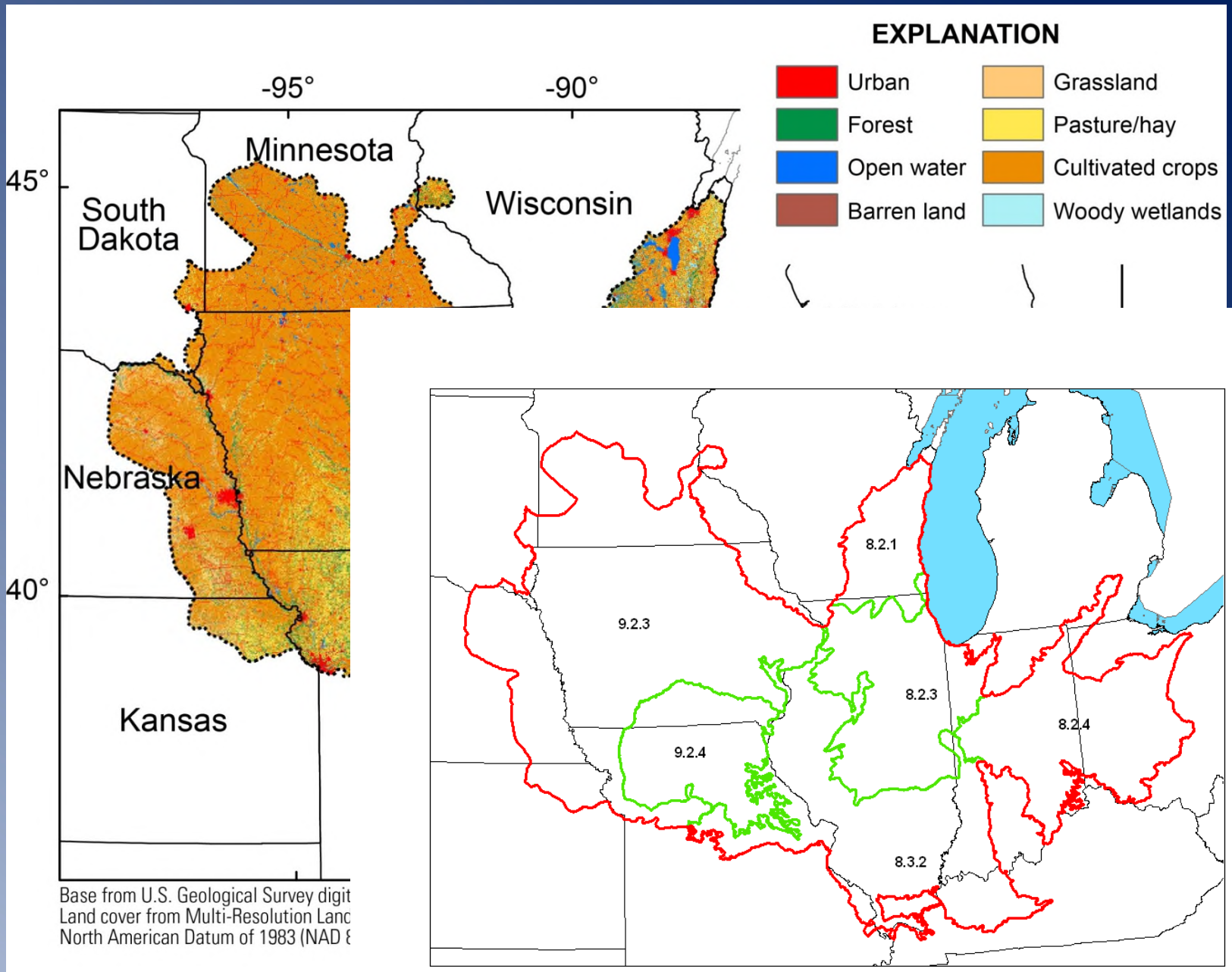

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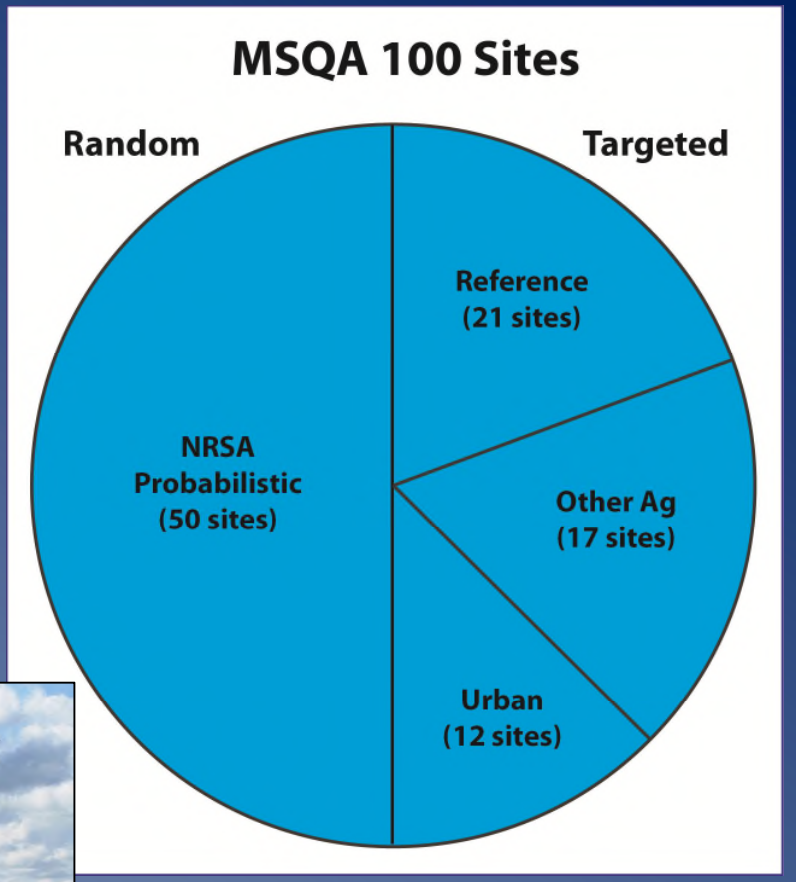
MSQA Study Area

MSQA Sites

- Match our sampling to NRSA's first 50 random sites
- Fill out stressor gradients with 50 targeted sites:
  - Reference (21)
  - Urban (12)
  - Trend and other high-priority sites – (17)



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Sampling at all 100 sites

All 12 visits, water samples:

Major ions or Cl/SO4 | Nutrients | Suspended sediment conc.
Pesticides | Glyphosate (IA) | 17β-estradiol (IA)

Three visits, Chlorophyll a, phytoplankton

Final visit - sediment samples: Major and trace elements Pesticides
OC and radionuclides Toxicity testing

Final visit Ecological survey

POCIS deployed for final 6 weeks, all samples analyzed
Current-use pesticides

SPMD deployed for final 6 weeks but not all will be analyzed

27 intensive sites: 12 ag, 12 urb, 3 ref

Final visit sediment samples:
Halogenated compounds
PAHs other SVOCs

Final visit tissue samples:
Halogenated compounds
Current-use pesticides

Every other visit water sample
Hormones (NWQL)
Glyphosate (KSWSC)

SPMDs analyzed
Halogenated compounds
PAHs and other SVOCs

10 sites: Pankow/tox 5 ag, 5 urban

Pankow daily water samplers and weekly composite (4 ag, 3 urban)
EPA to analyze for pesticides
NWQL weekly composite split

Every other visit whole water (10 sites)
Water toxicity (CERC)
Suspended and filtered

71 sites: NRSA Hg

Every other visit, grab water sample: MeHg and THg

Final visit fish tissue plug for Hg by NRSA

6 sites: continuous

N Processing: Continuous monitors (DO, N, etc.) Additional periphyton

8 sites: caged fish/frog

Caged fish and frogs CERC
reproductive endpoints and biomarkers

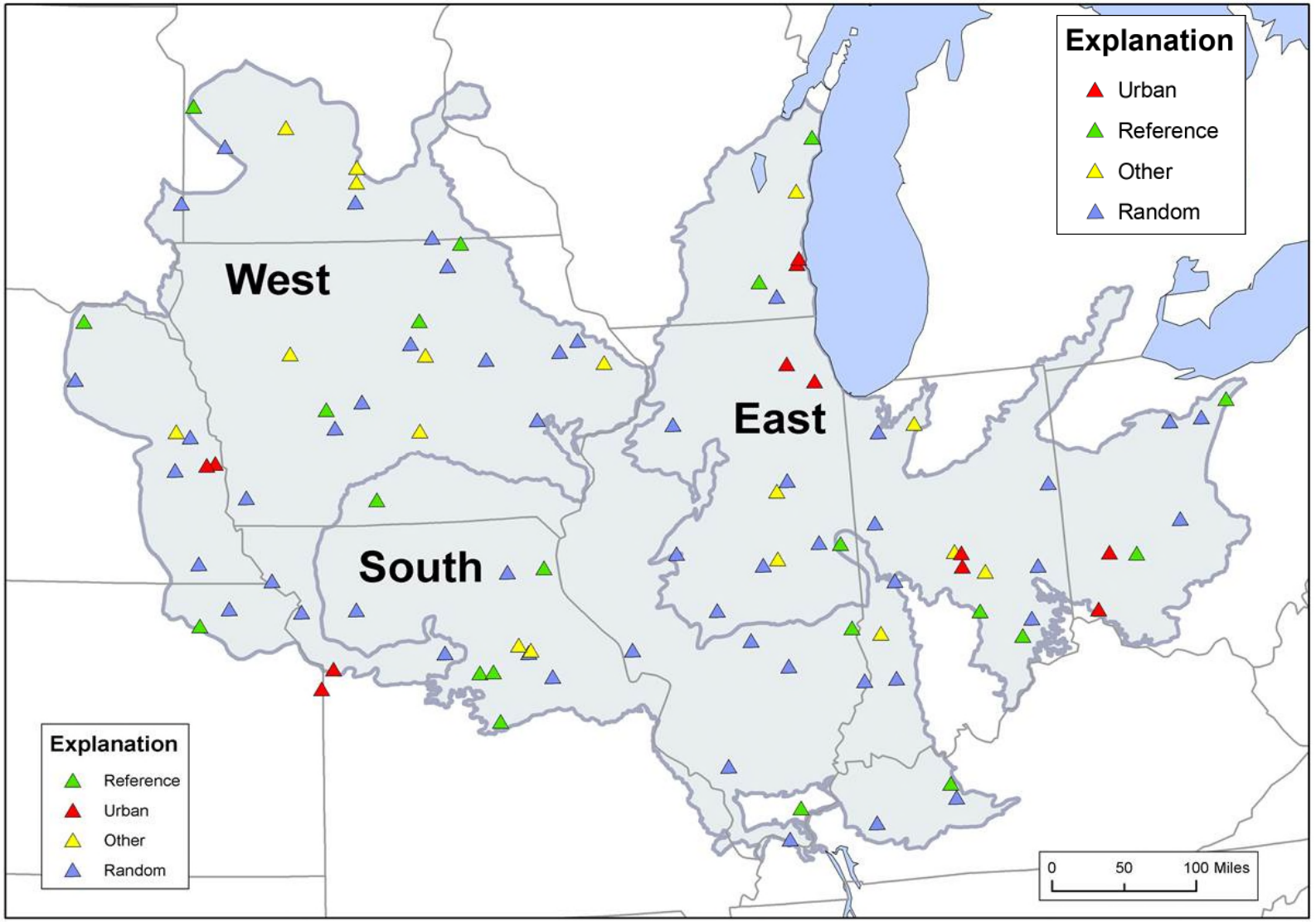
Typical Sampling Sites (100 sites) cont.

- Streamflow/ water levels (34 gages/ 66 ungaged)
  - Tape down from benchmark
  - Transducers
  - Discharge at least 4 times, range of flows

- Water temperature
  - Hobotemps at 34 gaged sites

MSQA Watersheds

MSQA Sampling Sites as of 4/22/13



MSQA Sites by State

Region V	Total (Ran, Int)
• Illinois:	19 (12, 2)
• Indiana:	15 (7, 4)
• Michigan:	(0)
• Minnesota:	8 (3, 2)
• Ohio:	7 (3,3)
• Wisconsin:	6 (2, 4)

Region VII	Total (Ran,Int)
• Iowa:	16 (9,2)
• Kansas:	3 (1,1)
• Missouri:	14 (7,4)
• Nebraska:	8 (4,3)

Other Regions

• Kentucky:	3 (2,0)
• South Dakota:	1 (1,0)

- Sites limited to 16 per state
- 7-8 sites per crew

Urban Sites (12-14):
Chicago, Cincinnati/Dayton, Indianapolis, Kansas City, Milwaukee, Omaha

MSQA/NRSA Timeline

All 100 sites

water tox on every second visit

Holiday: 27-May, 1-Jul

Date		6-May	13-May	20-May	27-May	3-Jun	10-Jun	17-Jun	24-Jun	1-Jul	8-Jul	15-Jul	22-Jul	29-Jul	5-Aug	12-Aug
Week	# of sites	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Water Chem typical	100	1	2	3	4	4	5	6	7	8	8	9	10	11	12	13
Water Chem intensive	27		1		2	2		3		4	4		5		6	
Water Chem Hg	71		1		2	2		3		4	4		5		6	
water toxicity	10		1			2		3			4		5		6	
Pankow	7	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
CHLa seston	100			1				2				3				
POCIS&SPMD	100															
Sediment Chem	100															*
Sediment Tox	100															*
Eco Survey	100															*

*only if eco not done, balance with early stops where eco done early

Intensive and Hg sites can sample either week in the combined boxes. Water tox sites need to be sampled the specific weeks.

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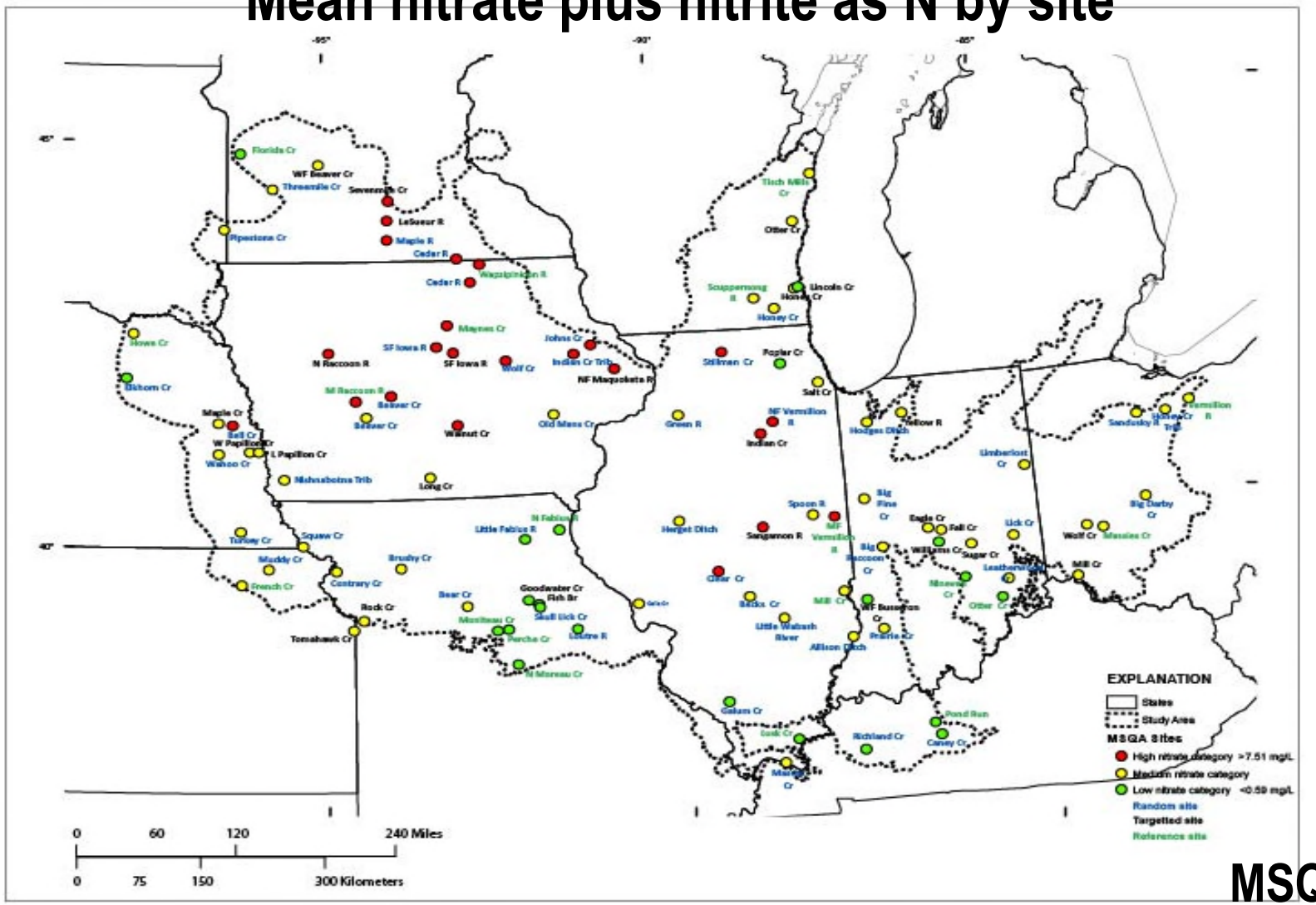
USEPA – USGS Collaboration

Early data - Nutrients

Spatially the highest nitrate concentrations by site were in IA, IL, MN

Mean nitrate plus nitrite as N by site



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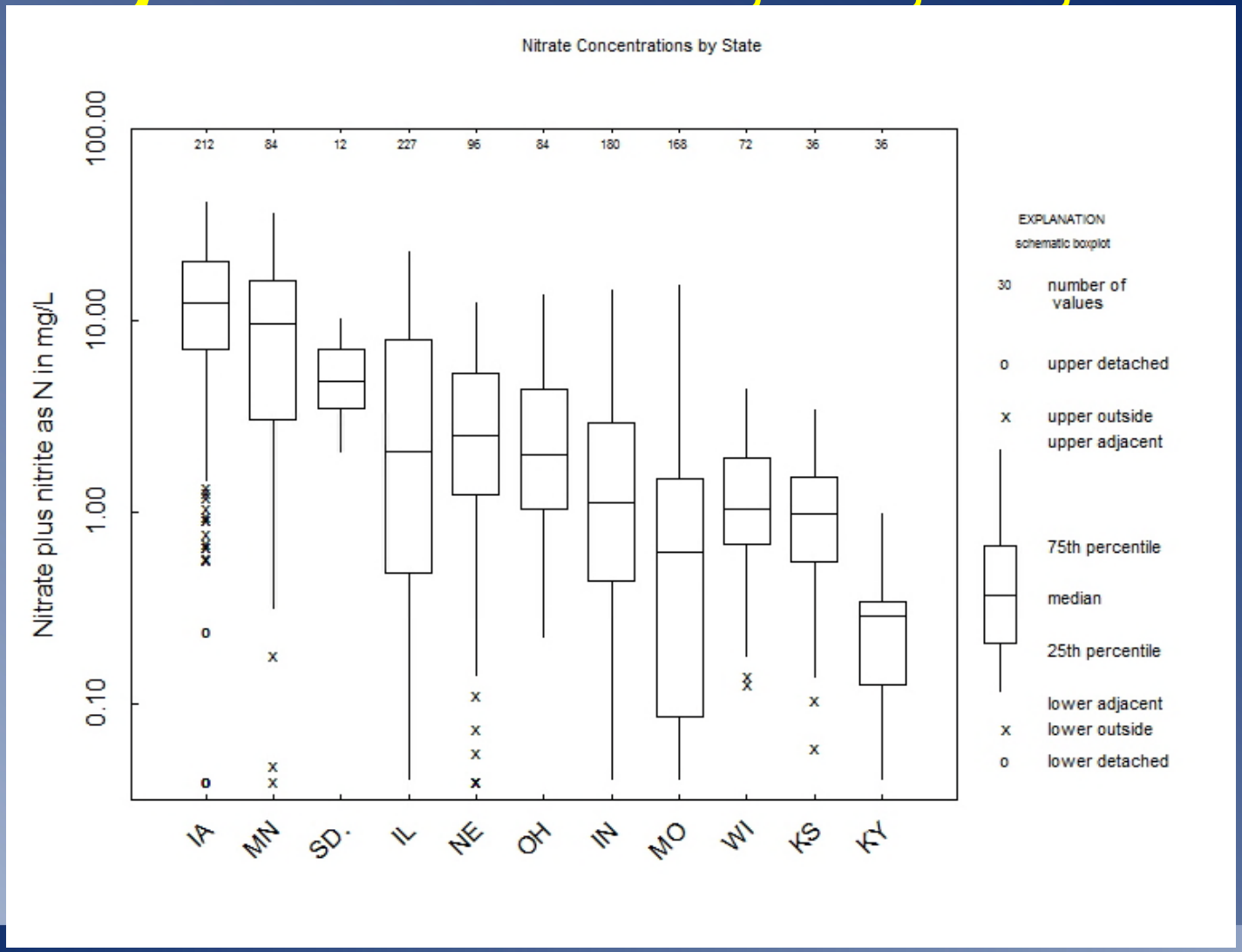
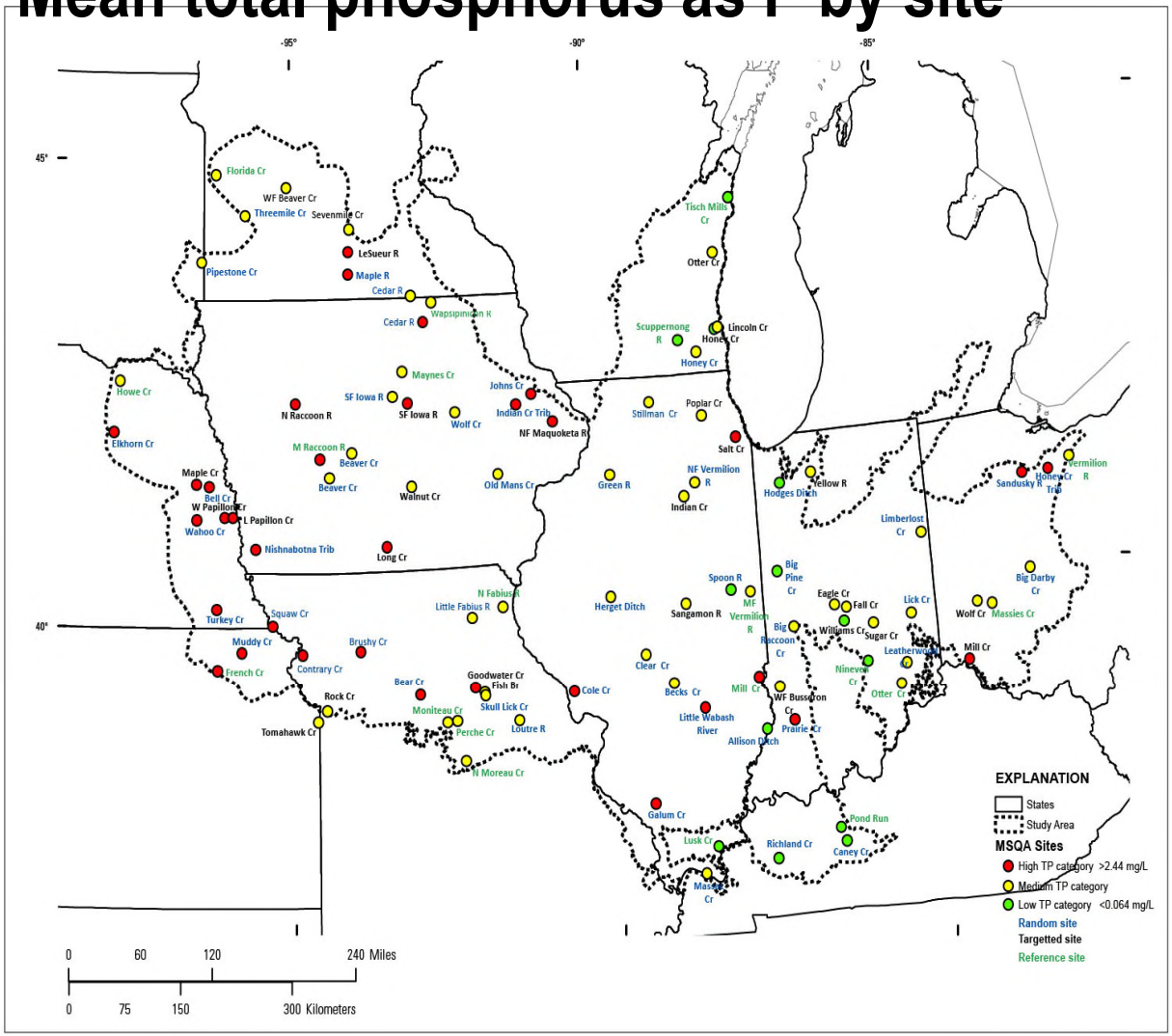
Spatially the highest Nitrate concentrations by state were in IA, MN, SD, IL



Spatially the highest Total Phosphorus concentrations were in NE, IA, MO, MN

Mean total phosphorus as P by site



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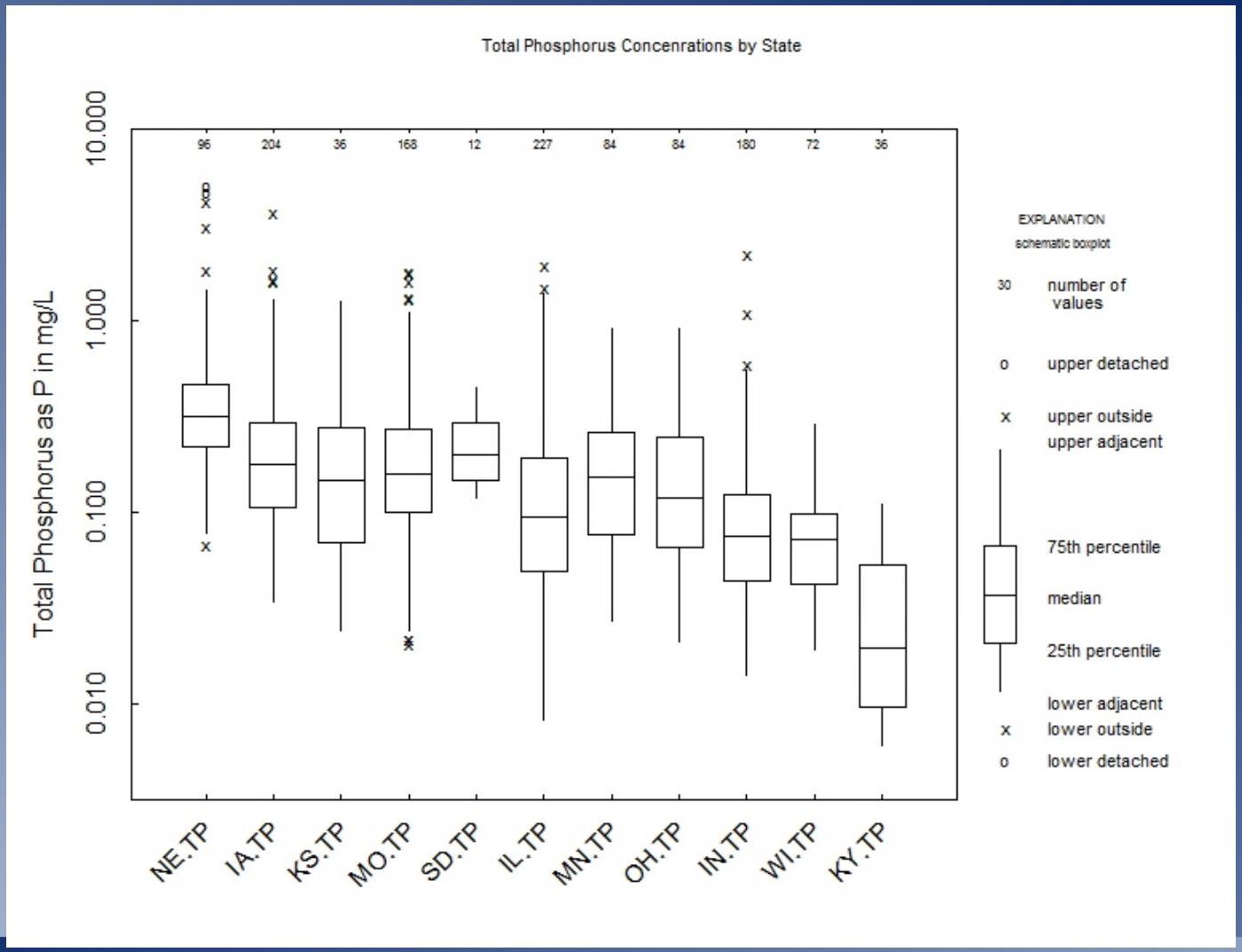
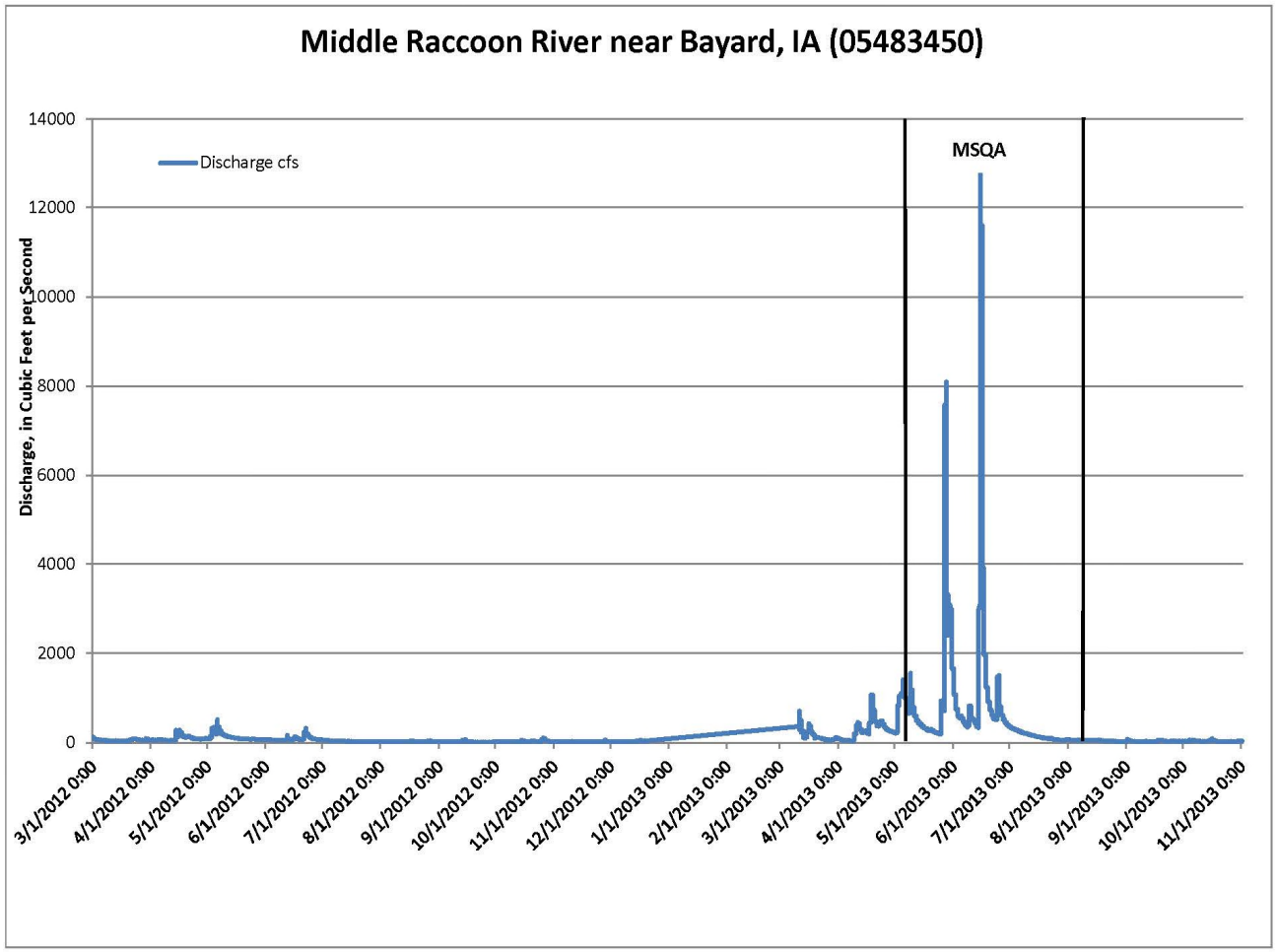
Spatially the highest Total Phosphorus concentrations were in West

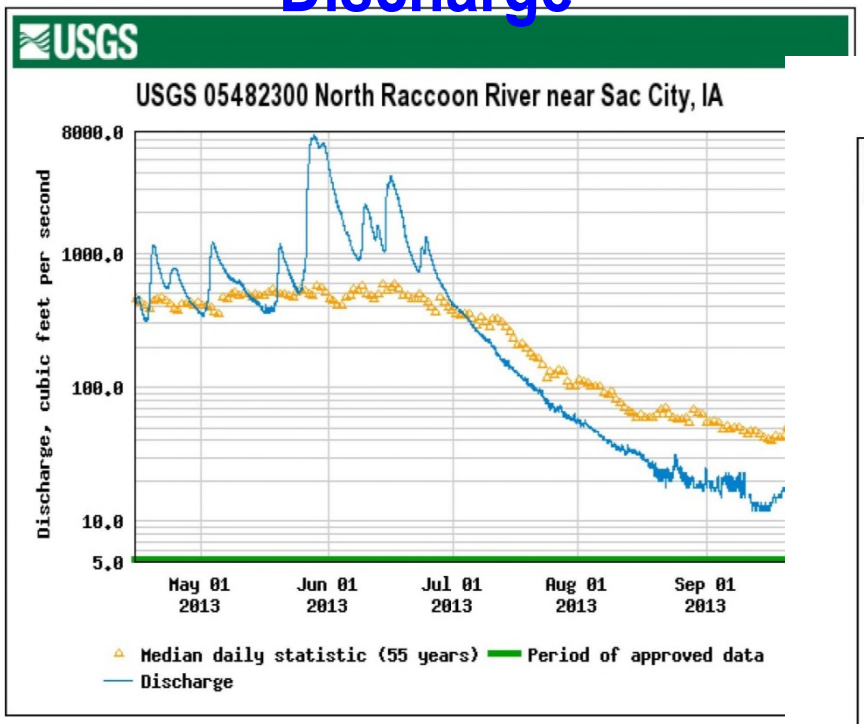


What does a drought look like?



High nitrate related to high spring streamflow and fall drought conditions

Discharge



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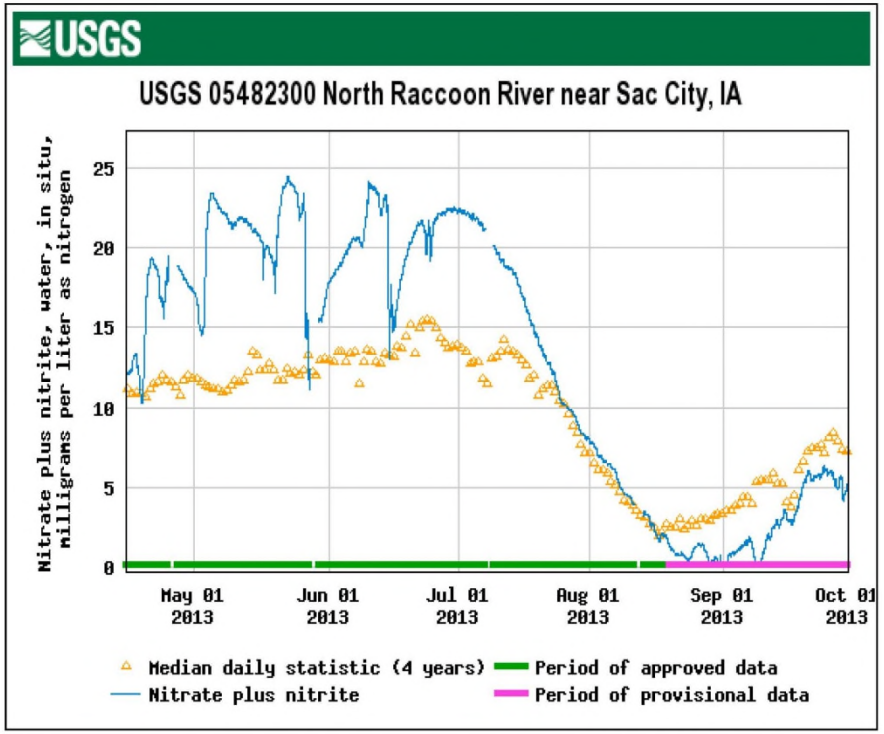
Nitrate



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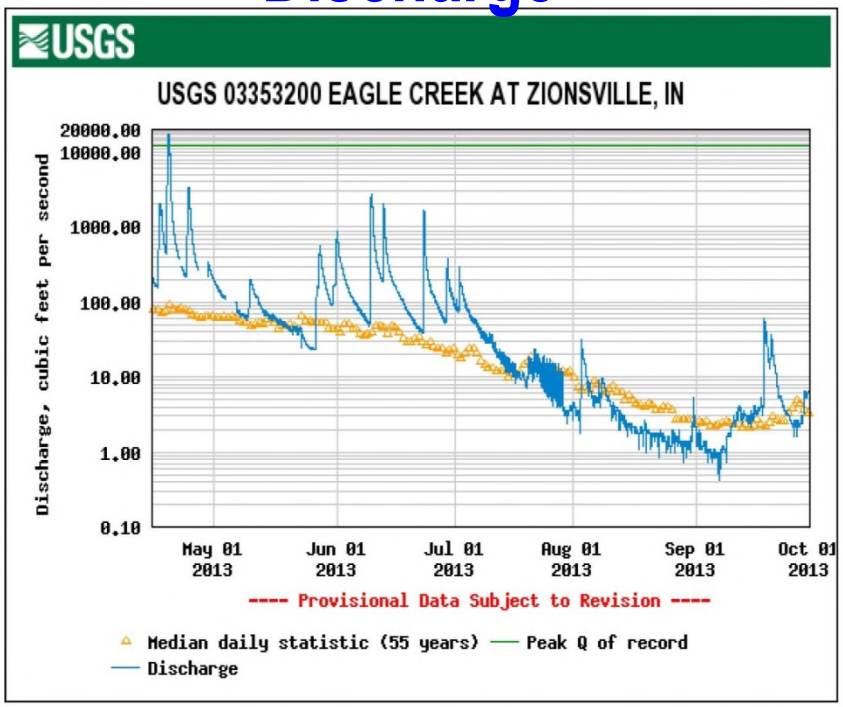
Looking at continuous streamflow and nitrate along with Stable N15/O18 data might allow us to nitrogen sources

Discharge



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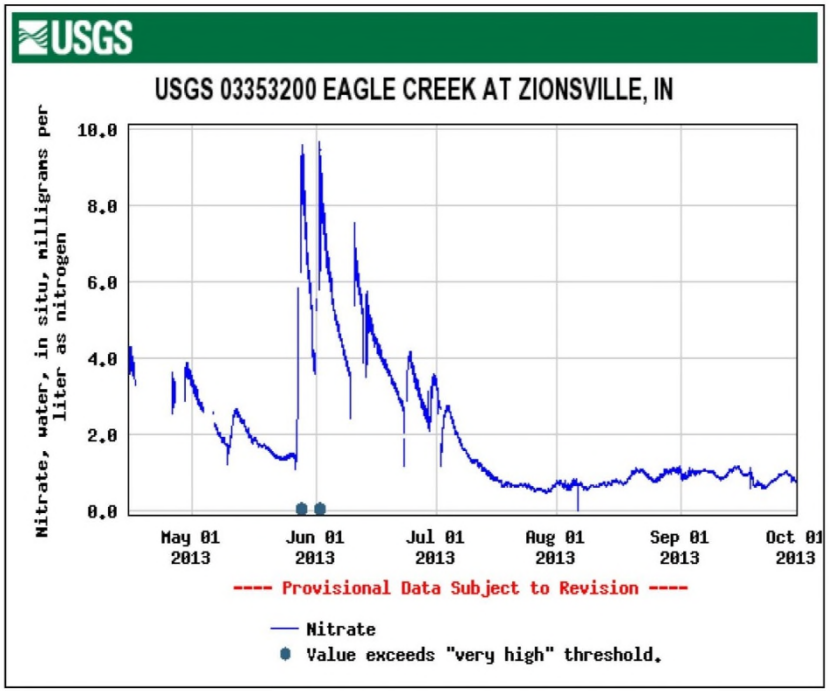
Nitrate



http://137.227.241.66/nwisweb/data/img/USGS.03353200.18.99137..20130415... 10/24/2013

Information and Contacts

NAWQA – USGS

http://water.usgs.gov/nawqa

NRSA – USEPA

http://water.epa.gov/type/rsl/monitoring/riverssurvey/index.cfm

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